STAFF REPORT

Rice Pesticide Program
Management Practices
for the 2007 through 2009 Rice Seasons

Each year, the California Rice Commission (CRC) submits an annual report detailing monitoring and implementation of management practices required as part of the Rice Pesticides Program (RPP). The CRC is a commodity group representing Californian rice growers. Rice growers plant in mid-April through early May and maintain flooded fields throughout the summer months. Pesticides are used on most fields for insect and weed control. Water quality concerns arise when pesticides applied directly into standing water in the field leave the field in tailwater.

In the early 1980's, the Rice Pesticide Program was established to address impacts to beneficial uses attributed to rice pesticides, including fish kills in agricultural drains and taste complaints in the City of Sacramento drinking water supply. In 1990, the Central Valley Regional Water Quality Control Board (hereafter the Water Board) amended the Basin Plan[1] to prohibit discharge of water containing five rice pesticides (thiobencarb, molinate, malathion, carbofuran and methyl parathion) unless dischargers follow Water Board-approved management practices.

On 28 December 2006 the CRC submitted their annual report titled *Rice Pesticides Program 2006 Annual Report*. The report provides a summary of 2006 Program activities including monitoring and enforcement components. The executive summary of their annual report is provided in **Attachment A**. Proposed 2007 Program recommendations are detailed in **Attachment B**. CRC recommends continuation of the current Program and management practices based on the trend of reduced thiobencarb detections.

Historical Perspective

The Water Board formalized the Rice Pesticide Program in 1990 by amending the Basin Plan to include an implementation program for the control of rice field discharges containing molinate, thiobencarb, methyl parathion, carbofuran, and malathion. The Basin Plan prohibits discharges of water containing the five pesticides unless dischargers follow Board-approved management practices.

The Water Board uses the performance goals shown in **Table 1** to evaluate the management practices. The performance goals apply to all waters designated as freshwater habitat. As stated in the Basin Plan, to obtain approval, proposed management practices must be expected to help meet these performance goals. Water Board approval of management practices is also dependent on compliance of discharges containing

[1] 4th Edition of the CVRWQCB Water Quality Control Plan

thiobencarb with the water quality objective[2] of 1.0 µg/l in water designated as municipal or domestic supply (i.e. the Sacramento River)[3].

Table 1. Performance Goals[4] for Management Practices

Chemical	*Performance Goal µg/l (daily maxima)*	*Product Name*	*Activity*
Molinate	10.0	Ordram®	Herbicide
Thiobencarb	1.5	Abolish® (liquid) Bolero® (granular)	Herbicide
Malathion	0.1	--	Insecticide
Methyl parathion	0.13	--	Insecticide
Carbofuran	No longer used on rice in California[5]		

Management practices are presented in detail as part of the CRC report. Most of these practices have been in place for years and have been shown to be effective in reducing discharges. This staff report provides a review of the Program results in 2006 and focuses on issues of concern. The executive summary of the CRC annual report (**Attachment A**) provides an overview of the Program results.

The Program includes monitoring, compliance and enforcement components. The County Agricultural Commissioners (CACs) implement the Program, including issuance of restricted materials permits for thiobencarb and molinate. Growers submit a Notice of Intent (NOI) at least 24 hours prior to application and report Notice of Application (NOA) within 24 hours of application allowing CACs the opportunity to observe applications and to track water holding times and other required management practices.

The core of the program consists of water management practices that require farmers to hold pesticide-laden water on the field until pesticides degrade to a level protective of aquatic life. Water holding times are stipulated in the permits issued by the CACs. Hold times are currently 28 days for molinate, 30 days for granular thiobencarb, 19 days for liquid thiobencarb, 24 days for methyl parathion and 4 days for malathion. Malathion holding times are not enforced through use permits since it is not classified as a restricted material. Shorter holding periods are allowed in areas with reduced water availability, fields in the San Joaquin Valley and hydrologically isolated fields.

Sacramento Valley rice fields discharge into major agricultural drains flowing into the Sacramento River. The Colusa Basin Drain serves as a major western tributary while Butte Slough drains from the east. The Program historically has sampled several locations over a 10 to 14-week period each year to evaluate compliance with performance goals.

[2] The CA secondary MCL is 1.0 µg/l.
[3] The Colusa Basin Drain and Butte Slough are not designated as municipal or domestic supply waters.
[4] These performance goals apply to freshwater habitat and are protective of fisheries.
[5] Carbofuran was one of the chemicals addressed by the control Program but use of the product on rice was banned by the US Environmental Protection Agency (US EPA) in 1999 with use of existing stock concluding in 2000.

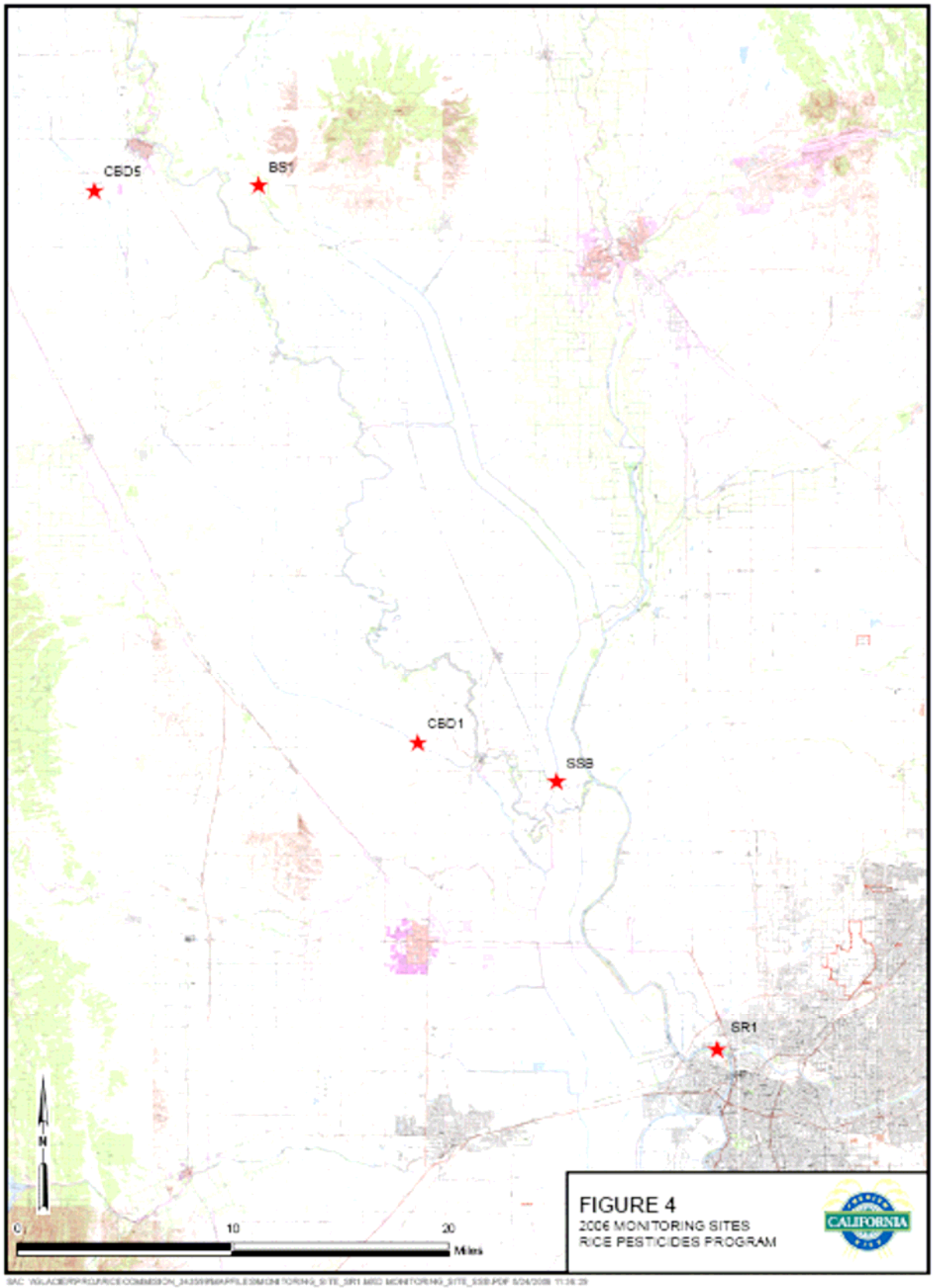
The 2006 CRC monitoring program was funded and administered by the CRC, with sampling conducted by a consultant and primary sample analysis conducted by pesticide registrants.

For the 2006 rice season, the CRC monitored five sites, as shown in **Figure 1** and described in **Table 2**, for nine weeks from 16 May to 11 July. The Cities of Sacramento and West Sacramento also monitored for nine weeks, from 22 May until 19 June for thiobencarb and molinate at their drinking water intakes on the Sacramento River. The City of West Sacramento intake is located on the Sacramento River upstream of the American River confluence. The City of Sacramento intake is located on the Sacramento River 0.3 km south of the American River confluence.

Table 2. RPP Monitoring Sites

Abbreviation	Name	Type
CBD5	Colusa Basin Drain (CBD) at Hwy 20 (Colusa County)	Ag drain
CBD1	CBD at Road 99E (Yolo County)	Ag drain
BS1	Butte Slough at Lower Pass Rd (Sutter County)	Ag drain
SSB	Sacramento Slough at gage upstream of Karnak Pumps (Sutter County)	Ag drain
SR1	Sacramento River at Village Marina (Sacramento County)	River
Municipal Intake Sites		
SSR	City of Sacramento Intake, Sacramento River 0.3 km downstream of the American River (Sacramento County)	River
WSR	City of West Sacramento Intake at Bryte Bend (Yolo County)	River

Figure 1. Rice Pesticide Program 2006 Monitoring Sites

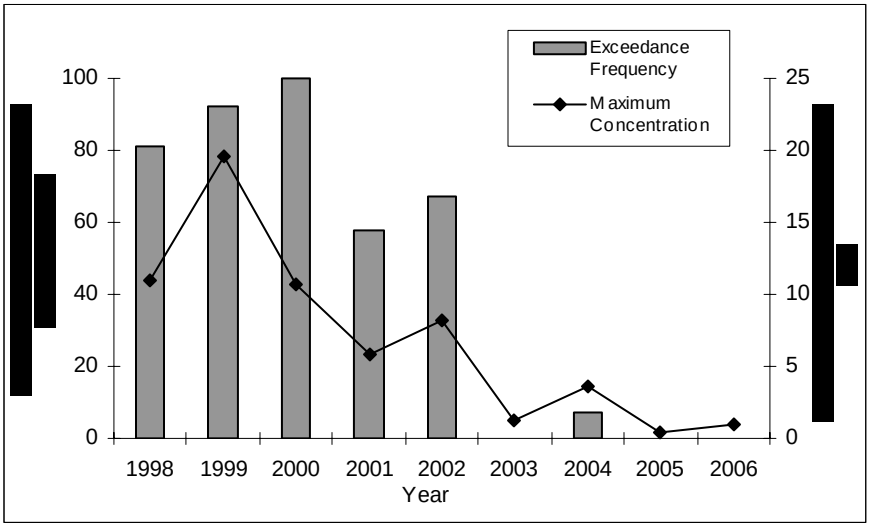


Overall, the Program has proven to be highly successful in reducing the threat to aquatic life posed by rice field discharges. The Program has resulted in significant reductions in rice pesticide concentrations in waterways through the modification of management practices.

Thiobencarb

Thiobencarb is an herbicide used to control annual grasses including watergrass. Though monitored at five sites, looking closely at one monitoring site CBD5 helps illustrate the trend in pesticide concentration seen in recent years. The frequency of detection above the 1.5 µg/l performance goal and maximum thiobencarb concentrations at CBD5 over the last nine years are shown in **Graph 1**. There has been a dramatic reduction in both peak thiobencarb levels and exceedance of the performance goal in recent years. In 2006 there were no exceedances of the performance goal. The peak detection of 0.97 µg/l occurred on 1 June; typically the highest detections occur in mid to late May, corresponding with peak applications of the product.

Graph 1. Annual exceedances of thiobencarb water quality performance goal and maximum concentrations at CBD5



In addition to the monitoring conducted by the CRC, downstream municipalities also monitor thiobencarb at their drinking water intakes. During years with high thiobencarb detections, the cities have received customer complaints regarding an off taste in their drinking water. **Table 3** summarizes the City of Sacramento and the City of West Sacramento's monitoring results. Monitoring at Sacramento's intake generally detects lower thiobencarb concentrations than those observed at West Sacramento's intake, most likely due to the location of the intake below the addition of the American River, which is essentially free of rice drainage.

From 1997 until 2002, City of Sacramento monitoring revealed a general trend of increasing thiobencarb concentrations, as shown in **Table 3**. From 2003 through 2006, thiobencarb levels have been much lower, most likely due to new permit conditions added in an extensive effort to address thiobencarb.

Table 3. Thiobencarb detections at the City of Sacramento (1994-2006) and City of West Sacramento (2001-2006) Intakes

Year	Municipality	Number of Detections[6]	Peak Concentration (µg/l)
1994 - 1997	Sacramento	0	--
1998	Sacramento	1	0.14
1999	Sacramento	5	0.34
2000	Sacramento	6	0.28
2001	Sacramento	4	0.38
	West Sacramento	4	0.59
2002	Sacramento	8	0.91
	West Sacramento	8	1.60
2003	Sacramento	0	--
	West Sacramento	3	0.16
2004	Sacramento	0	--
	West Sacramento	0	--
2005	Sacramento	0	--
	West Sacramento	1	0.11
2006	Sacramento	0	--
	West Sacramento	1	0.16

Molinate Phase-out

Molinate is an herbicide used to control watergrass in rice production. Molinate was one of the primary triggers for the formation of the Rice Pesticide Program after it was identified as a primary cause of fish kills in the early 1980s. Though the Program has been highly successful in reducing molinate in discharges to levels that do not threaten fish, until recently molinate concentrations continued to routinely exceed the Board's performance goal at several monitoring locations. The occurrence of these violations near the time of application pointed to drift and seepage as likely contributing factors. Storm-event related discharges might also contribute to molinate peaks in years when storms occur near the time of peak pesticide application, such as the 2002 rice season.

The US EPA periodically reassesses the registration status of pesticides. On 2 April 2003, the US EPA announced availability of a risk assessment for molinate[7]. The risk assessment found that molinate may pose a risk concern to worker safety and mammalian reproduction. The EPA also stated that chronic exposure to molinate may pose a risk to freshwater invertebrates in agricultural drains and small rivers.

[6] Limit of Detection is 0.10 ppb, except 2001: 0.2 µg/l
[7] US EPA Federal Register 2 April 2002. *Molinate; Availability of Risk Assessment.*

On 7 April 2004, the US EPA published a federal register notice[8] issuing a cancellation order at the request of the pesticide registrants. The cancellation includes a multi-year phase out as follows: In 2006, registrants may distribute no more than the 2002 sales level of the molinate active ingredient while 2007 sales may not exceed 75% of this amount. In 2008, registrants may not sell or distribute more than 50% of the 2002 levels. No sales or distribution of molinate products is to occur after June 30, 2008, except for using up existing stocks. The registrant is required to report sales to the US EPA during the phase-out and non-compliance results in immediate cancellation.

Contributing Factors to Continued Detections of Rice Pesticides

In the early years of the Rice Pesticide Program, tailwater was the main source of rice pesticides. As management practices evolved to include longer holding times, drift and seepage emerged as primary contributors of pesticide residues in surface water. Storm events can also play a role in thiobencarb and molinate spikes, as was observed in 2002.

Application Drift

The majority of rice pesticides are applied by air. The Program first officially recognized aerial drift as a problem in 1991[9]. By 1994, the Board approved a DPR implementation program to control drift[10]. Drift prevention requirements now stipulated in the approved management practices include buffer zones, nozzle specifications and limits on wind speeds.

Seepage

Seepage occurs when water moves laterally off rice fields through levees or borders into an area outside of the field boundaries, after which there is the potential for the pesticide-laden discharge to enter waterways. In 2001, the Board stated that "discharge of seepage water from treated rice fields to surface water during the pesticide holding periods described in the DPR Program is not an approved management practice if such seepage contains malathion, methyl parathion, molinate or thiobencarb"[11].

The Program has acknowledged the potential contribution of pesticides via seepage for over a decade. In 1993, DPR proposed to investigate the potential for rice pesticide movement through levees[12]. In 1998 DPR acknowledged that seepage appears to be, along with drift, the most significant sources of pesticides in rice drainage[13]. The Board then asked DPR to provide the specific steps and implementation dates for the measures they are taking to address seepage[14]. In response, in 2000 DPR monitored the

[8] US EPA Federal Register 7 April 2004. Molinate: *Cancellation Order*.
[9] CVRWQCB *Resolution No.92-041* February 1992
[10] CVRWQCB *Resolution No. 93-035* February 1993 and *Resolution No.94-083* May 1994
[11] CVRWQCB *Resolution No.5-01-074* 16 March 2001
[12] CVRWQCB *Resolution 93-035* February 1993
[13] CVRWQCB *Resolution 98-024* January 1998
[14] CVRWQCB *Resolution 98-024* January 1998

concentrations of thiobencarb and molinate in seepage water at one site in both Glenn and Colusa counties[15].

The Program has used educational outreach in an attempt to voluntarily reduce field seepage. CACs provide growers with two handouts that detail voluntary actions that can be taken to address seepage: *Closed Rice Water Management Systems* (USDA/UCCE[16]) and *Seepage Water Management-Voluntary Guidelines for Good Stewardship in Rice Production* (UCD[17], DPR and UCCE).

Starting in 2001, the Program required growers to compact levees to prevent seepage and CACs to conduct seepage inspections. When the Board approved the Program for the 2002 and 2003 seasons, the Resolutions[18] requested for DPR to continue seepage inspections and to report back on repeat violators and actions taken to address the occurrence. In a April 2002 letter[19], DPR requests the CACs to take enforcement action on repeat violators. Staff has continued to request information on repeat violators, though none have been identified to date. The CACs continue to conduct seepage inspections and take enforcement action as necessary, which is summarized by the CRC in their annual report.

Storm Events

Weather can have a significant impact on the performance of the rice pesticides control effort. Warm dry seasons may result in lower pesticide concentrations due to higher degradation rates during the water hold. Wet cold years may see the opposite effect.[20] During large storms, farmers may encounter problems maintaining their water holds because the extra water threatens the levees in the fields. When this happens, farmers may apply to their CAC for an emergency release.

Emergency Releases

Emergency releases are only granted to growers who can demonstrate need due to events outside of their control. Causative factors necessitating early release may be storm event related reasons (i.e. rainfall, high winds) or other factors such as salinity. Releases are restricted to molinate treated field that have been held a minimum of 11 days and thiobencarb fields held at least 19 days. Tailwater may only be released in the amount needed to mitigate the documented problem and prevent loss of the crop. Beginning in 1994, if a grower has repeat violations of water holds they must make improvements in

[15] DPR Memorandum *Results of Thiobencarb Monitoring at Seepage Sites in Colusa and Glenn Counties 7* December 2000.
[16] United States Department of Agriculture and University of California Cooperative Extension
[17] University of California Davis
[18] CVRWQCB *Resolution No.R5-2002-0080* April 2002 , CVRWQCB *Resolution No.R5-2003-0036* March 2003
[19] DPR letter *Rice Pesticides Program for 2002 (to CACs)* 2 April 2002
[20] DPR *Information on Rice Pesticides Submitted to the California Regional Water Quality Control Board Central Valley Region* 31 December 1996

their water holding capabilities. This may include installation of pumps for tailwater re-circulation or the use of fallow land for spillage.

In 2006 no requests were made for emergency releases. In comparison, following the storms of 2002, 33 emergency releases were granted. Past rice seasons with May storms resulted in greater numbers of emergency releases, such as 1998 (103 fields)[21], 1996 (80 fields)[22] and 1993 (164 fields)[23].

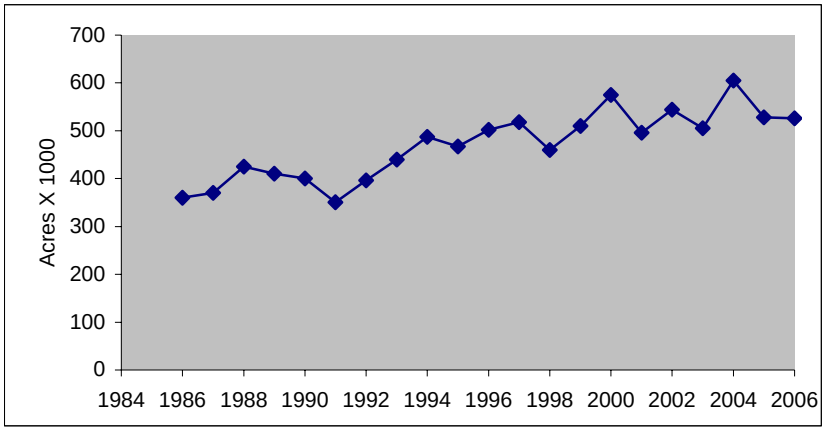
CRC 2006 Annual Report

In the fall of 2002, DPR advised the Water Board and rice industry that it would change their role in the Program from the primary responsible party to that of a co-regulator with the Water Board. DPR continues to provide enforcement data and pesticide use data to the CRC for inclusion in the annual report. They also fund and provide guidance to the CACs on management practices including an annual memo outlining the Board-approved conditions for the coming season.

During the 2003 rice season, the CRC assumed full responsibility for the Program, including monitoring, submittal of the annual report to the Water Board and proposing management practices for the next rice season. The CRC's 2006 report includes data that is used to evaluate compliance with the performance goals and to determine if any programmatic changes should be considered.

Trends in Rice Acreage - In 2006, rice acreage in the Sacramento Valley totaled 526,000 acres, 2000 acres less than in 2005. **Graph 2** shows that acreage has generally been increasing since at least 1986.

Graph 2. Total Rice Acreage in the Sacramento Valley 1986 – 2006.

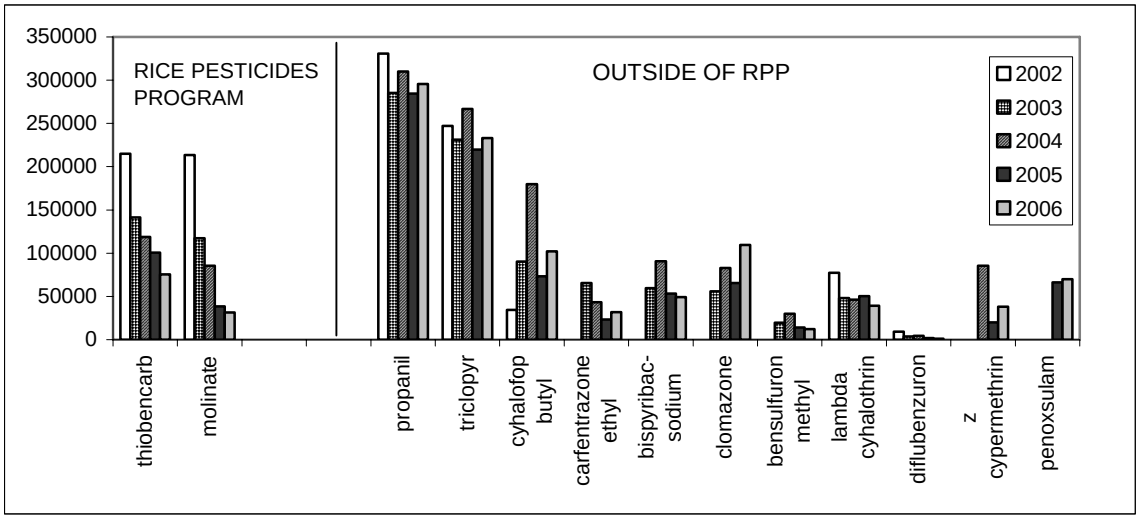


[21] DPR *Information on Rice Pesticides Submitted to California Regional Water Quality Control Board Central Valley Region* 31 December 1998.
[22] DPR *Information on Rice Pesticides Submitted to California Regional Water Quality Control Board Central Valley Region* 31 December 1996.
[23] DPR *Information on Rice Pesticides Submitted to California Regional Water Quality Control Board Central Valley Region* 8 March 1994.

Trends in Pesticide Use - **Graph 3** shows the number of acres treated with thiobencarb and molinate over the last six years. Thiobencarb and molinate saw a sustained high level of use from 1997 to 2002. In the last four years however, use of both products declined. Molinate in particular has seen a dramatic decrease in use, likely due to the upcoming phase-out of the product in several years.

As shown in **Graph 3**, in recent years a number of new rice pesticides have emerged. These new pesticides and other constituents of concern in rice field drainage are being addressed by a rice-specific Monitoring and Reporting Program issued to the CRC under the Irrigated Lands Waiver[24]. Use of new herbicides that control watergrass (such as cyhalofop-butyl, clomazone and bispyribac-sodium) is expected to continue to rise as molinate is phased out.

Graph 3. Rice acreage treated, by chemical: 2001-2006.

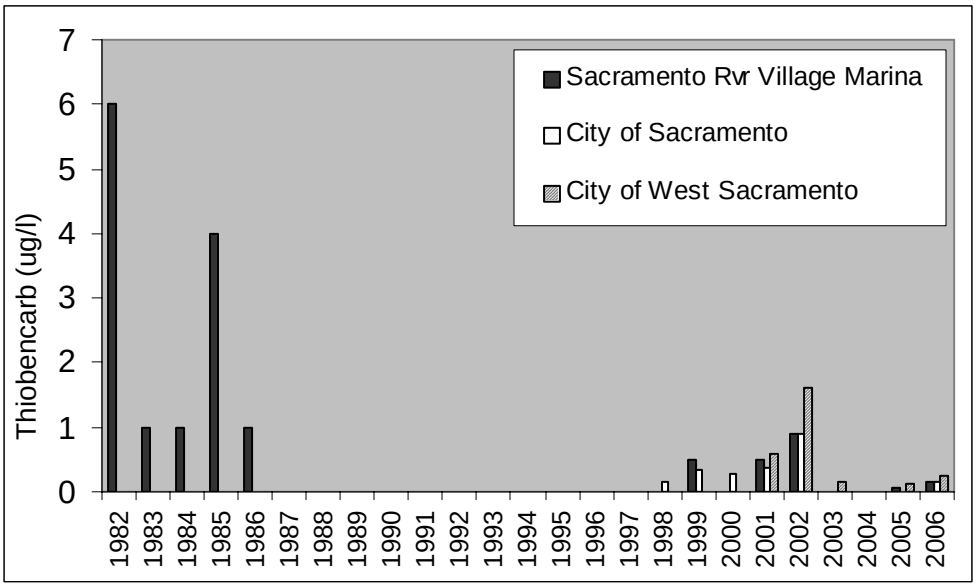


Monitoring Data

Thiobencarb –Thiobencarb levels monitored in 2006 remained below the primary MCL of 70 µg/l, the secondary MCL of 1.0 µg/l and the performance goal of 1.5 µg/l. Fifty-three of 65 samples collected at the five Program sampling sites had detectable levels of thiobencarb. The peak detection was 0.97 µg/l in the Colusa Basin Drain at Highway 20 on 1 June.

[24] 18 Nov 2004. Central Valley Regional Water Quality Control Board. *Monitoring and Reporting Program Order No. R5-2004-0839 for the California Rice Commission under Resolution No. R5-2003-0105 Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands.*

Graph 4. Historical trend of peak thiobencarb concentrations in the Sacramento River from 1982-2006[25]



Graph 4 shows the historical trend of peak thiobencarb concentrations detected at monitoring sites on the Sacramento River. In 2006, thiobencarb was detected at low levels at the City of West Sacramento (0.16 µg/l) and the SR1 monitoring site (up to 0.17 µg/l)[26]. These levels were much lower than the 1 µg/l secondary MCL, which is protective of the taste of drinking water.

Molinate – Molinate levels did not meet or exceed the 10µg/l performance goal in 2006 at any of the five sites monitored**.** Twenty of the 70 samples collected at five sample sites had detectible levels with a peak of 6.34 µg/l seen at BS1 on 1 June. The City of West Sacramento had 4 detections with a peak concentration of 0.24 µg/l while the City of Sacramento had 2 detections, with a peak concentration of 0.13 µg/l All samples collected at the city intakes were much lower than the primary MCL of 20.0 µg/l.

Other Constituents - Methyl parathion, malathion and carbofuran were not sampled during the 2006 rice season due to minimal to no use of the products.

Compliance and Enforcement

Emergency Releases – There were no emergency release inquires in 2006. Agricultural Commissioners generally grant emergency releases from fields prior to the end of the standard holding time only if necessary to prevent levees from being washed out or crops from being damaged.

[25] Select data obtained from DPR *Information on Rice Pesticides Submitted to California Regional Water Quality Control Board Central Valley Region* 31 December 1998.

[26] The CRC Annual Report reports the 0.07 ppb value however report also notes that their laboratories detection limits for thiobencarb are <0.1 ppb (APPL) and <0.5 ppb (Valent).

Compliance and *Application Inspections* – The CACs inspected molinate and thiobencarb fields for a variety of situations including application of the product, mixing/loading of the product, emergency release inquires, actual emergency releases, seepage and water holding requirements. CACs inspected 30 molinate treated fields and 37 thiobencarb treated fields during application. There were four enforcement actions taken related to application and mixing/loading of these two products. Inspections were also conducted to confirm that the water holds were being followed. 1221 fields were inspected consisting of 290 Ordram® 15GM treated fields, 868 Bolero® 15G fields and 64 Abolish™ 8EC treated fields.

Seepage –Table 5 provides a comparison of the number of seepage inspections and detections for the years of 2001 through 2006. One enforcement action was taken for seepage from a thiobencarb-treated field in 2006.

Table 5. Seepage Inspections 2001 – 2006

Year	Total Sites Inspected	Thiobencarb Treated Fields			Molinate Treated Fields		
		Sites Inspected	Sites with Seepage	%	Sites Inspected	Sites with Seepage	%
2001	2,129	527	14	2.7	1602	41	2.6
2002	1,956	N/A	15	--	N/A	43	--
2003	1,973	1,122	29	2.6	851	61	7.2
2004	N/A	935	4	0.4	N/A	N/A	--
2005	1,602	1,166[27]	35	3.0	436[28]	28	6.4
2006	1,222	929	34	3.6	292	26	8.9

Staff encourages DPR and the CRC to continue to emphasize seepage reporting. CACs are encouraged to follow the example of Glenn County where pre-application seepage inspections are conducted and if discovered, a restricted use permit was not issued to these growers. We continue to request that DPR and the CACs notify the Board within 30 days of any repeat seepage incidents so that enforcement may be explored since the Water Board has the regulatory option of issuance of Cleanup and Abatement Orders to individual dischargers that do not comply with approved management practices.

Discussion

The Water Board has been reviewing control efforts associated with pesticide discharges from rice fields since the early 1980s. In 2006, the Water Board approved management practices that were last updated in 2003 to control discharges of five specific pesticides used on rice. As noted above, these practices resulted in full compliance with performance goals and water quality objectives at all Program monitoring sites. Based on anticipated trends in pesticide use, these practices should continue to protect water quality.

[27] Determined by information in Table 12 of the CRC's *2005 Annual Report*. Total Seepage determined as total of No. Sites w/ No Seepage, No. Sites w/Less Than 5 GPM and No. Sites w/ More Than 5 GPM.
[28] Determined by information in Table 12 of the CRC's *2005 Annual Report*. Total Seepage determined as total of No. Sites w/ No Seepage, No. Sites w/Less Than 5 GPM and No. Sites w/ More Than 5 GPM.

Recommendations

The Water Board may decide one of several alternative actions: no action, which would retain a conditional prohibition of discharges containing the five rice pesticides; approval of a program with the CRC's proposed conditions, which would entail a program very similar to that of the past four seasons; or approval subject to new or additional conditions.

Recently, the Board has reviewed and approved proposed management practices for the Rice Pesticide Program on an annual basis. In the mid-1990's however, the Board approved use of the practices for three-year periods. Given the recent program results, staff recommends approval of the program for the 2007 through 2009 seasons with the conditions as proposed by the CRC. Water quality monitoring will continue and annual reports will be required, but Board review will not required during this period as long as there is no observed trend that indicates a threat to beneficial uses.

February 2007
AES/RJS

Attachment A: Executive Summary of CRC 2006 Annual Report
Attachment B: CRC Recommendations.